

SCIENCE

FRIDAY, JANUARY 20, 1888.

WASHINGTON SEEMS DESTINED in the not very distant future to become a leading scientific centre for the student of natural history. The Smithsonian Institution and the National Museum have long offered unsurpassed facilities for research in most branches of science, although there has been a lack of facilities for the study of natural history from live subjects. The National Museum, however, has taken a step in the right direction at last, and has made a collection of live animals, which, though unimportant at present, may prove the nucleus of what may, with proper congressional aid, be made the most valuable zoölogical collection in the country. In addition to this, the Fish Commission is preparing a fine collection of fresh and salt water fishes, mostly confined to those of economic value, but which will incidentally contain many varieties of marine life not valuable for food, but interesting for study. There are at present about forty varieties of fresh fish on exhibition in addition to the regular hatcheries of carp, shad, etc. The most interesting of these is a small fish from South Carolina, which brings forth its young alive, as animals do, instead of in the form of eggs, as is almost the universal custom of fishes. In another tank may be seen nearly one hundred Mississippi River catfish from a river in the neighborhood of Quincy, Ill. These are Western fish, and the Fish Commission intends to introduce them into Eastern rivers on account of their great value as food-fish. The flesh is white, firm, and of fine flavor. The present experiment is to determine whether they will spawn in captivity. Another tank is full of beautifully marked goldfish originally from Japan. Goldfish are not indigenous to any part of America, and are all of Asiatic or Japanese origin, the latter being much the handsomest. Several specimens of the California grayling, the gamest of all the gamey fishes, are also to be seen. A fine collection of salt-water fauna will also be brought from Wood's Holl, Mass., where it has been for some months, and placed on exhibition in Washington. In addition to the various food-fishes of the ocean, the exhibit will contain many other interesting forms of sea-life. The location of the exhibition in the Armory Building leaves much to be desired, and it is but poorly adapted for the needs of the work. Such a collection should be located in a building built expressly for the purpose, which will, in all probability, be ultimately erected. The exhibit of salt-water fishes is intended, in addition to its affording valuable means of study, to demonstrate the feasibility of keeping a collection of ocean fauna at a point remote from the sea. The water used will be artificial sea-water, and the experiment has never before been made on so large a scale. The difficulties attending the transportation of sea-water prevent such exhibitions at any distance from the sea. The exhibit will be tastefully and conveniently arranged. The asphalt floor is always dry, and the display interesting and instructive to the layman as well as to the scientist, and will also give valuable aid in the other work of the Fish Commission.

IN THE JANUARY ISSUE of the *Journal of Mental Science*, Miss Ellen F. White gives a most interesting account of medical gymnastics. We hear in this country more or less about the Swedish movement-cure, but it is quite usual to regard it as simply a new phase of quackery. It is, however, something very far removed from quackery, and Miss White's paper on it makes this very clear. Ling, the originator of the system, was a Swedish officer, who hap-

pened to discover that a lameness in his own arm was cured by fencing. He reflected on this fact, and then made an exhaustive study of anatomy, physiology, and pathology for the purpose of testing the principle which he thought he had discovered. As a result he evolved his system; and it includes medical, military, and educational or hygienic gymnastics. The object of the latter is to preserve the balance of power in the body: that of the former is to restore the balance when it has been disturbed by a loss of the proper proportion between the parts. The theory premises that blood is the carrier of life and of disease, and that the flow and the quality of blood can be controlled, or at least regulated, by gymnastics. The writer instances a number of cases and of affections which substantiate these claims, and describes the various classes of movements, and explains their nature and aims. She mentions the fact, which is very evident to us in the United States, that hundreds of so-called gymnasts, who may have been a few months or a few weeks only under a teacher, are advertising themselves as specialists, and bringing discredit upon the whole system. If it is to establish itself in the public confidence, it must be taken out of the hands of charlatans and quacks.

THE UNITED STATES HYDROGRAPHIC OFFICE.

AN important bill has just been introduced in Congress by which it would seem as though the continued efficiency of this office, both as regards its relation to the navy, of which it is a most important and necessary adjunct, and to commerce and the entire maritime community, would be insured. The bill referred to provides for the appointment of a permanent hydrographer and assistant hydrographer, to be nominated by the President and confirmed by the Senate.

Few landmen are in a position fully to appreciate the scope and character of the work done by this office, much of it being of a purely technical character, involving the preparation of charts, sailing-directions, light-lists, etc., for the use of navigation in every port of the globe. Until recently, however, the tour of duty of the officer detailed as hydrographer has been so short, in accordance with the usual custom in the navy, that it has been impossible to do more than keep up the routine work of the office, which in itself requires unremitting attention and care. Thanks to a longer detail than usual, granted by Secretary Whitney at the request of the chief of Bureau of Navigation, in order to develop the latent possibilities of the office, the present hydrographer has succeeded in lifting it out of the old ruts in which it was moving, and has infused into it renewed life and energy; so much so, indeed, that it is now fully recognized as one of the great scientific bureaus of the government, and the cordial assistance and support which it is receiving from masters of vessels show far more forcibly than words can do the great practical value of its work. Branch offices have been established at six of our principal seaports, and with such success that more are demanded at other ports; American charts and other hydrographic publications have come to the front again; and last, but by no means least, the monthly Pilot Chart, a publication which is unique of its kind, has been established, and has obtained an influence and importance well attested by the fact that a large edition is generally exhausted in a few days after it is issued. All those of our readers who have crossed the Atlantic during the past three years have probably had an opportunity to form their own ideas regarding the esteem in which it is held by masters of vessels.

To keep such an establishment moving smoothly, economically, and efficiently, undoubtedly requires a longer tenure of office for its responsible head than the three years prescribed by naval custom; and the bill which is now before Congress must receive hearty and

undivided support from the scientific world, no less than from owners and masters of vessels, marine insurance companies, and, indeed, from the general public, for who is not interested in lessening the hazards of the sea? The relations which have grown up and the interchange of data now carried on between this office and other scientific bureaus of the government, no less than the recognized value of this most appropriate work for naval officers in times of peace, mark a new era in naval administration, the permanency of which should be guaranteed. The people of the United States are quick to recognize good work, and nothing can strengthen confidence in and support of the navy more than the assured permanency of the praiseworthy work of the Hydrographic Office.

THE GROWTH OF CHILDREN.

THE systematic measurement of the several parts of the human body, together with the testing of their functions, has developed into the science of anthropometry. The plan of establishing an anthropometrical laboratory, where, for a small fee, any one can have himself weighed, measured, and his powers tested, which Mr. Galton has so often and so ably advocated, seems about to be realized. The results of such measurements, when widely taken and ably compared, will be to practical biology and hygiene what statistics, in the present use of the term, are to economical science, — the experimental basis of their practical application. As in the latter, so in the former, the stating of these results in accurate form at once opens up a number of questions never before considered, and at the same time helps to solve those that have been brought to notice. In this department of study no field has been cultivated with so much zeal as the study of the growth of children, mainly because this is a field where the practical lessons can be most effective. In a recent number of a German scientific journal, Professor Gad of the University of Berlin, sums up the recent studies upon the growth of children, and thus makes accessible some very interesting facts.

About one-fourth of a human life is spent in the period of growth; and this implies not merely addition of material, but assimilation, re-formation. It involves, too, in some cases, the enlargement and change of form of elementary cells, but in most cases the formation of new cells by cell-division. We know more about the growth of the skeleton than about that of the soft parts of the body; but a more detailed knowledge of the growth of its several parts is highly desirable. The height and weight of the entire body are the most readily observed, and about them the information is most accurate. The female child weighs, on the average, 3, and the male 3.5 kilograms. At the fifteenth year the weight has become twelve times this amount. The greatest changes occur in the first year. At the end of the second year, the body weighs three and a half times its original weight, and about one-fifth more than at the end of the first year. In the third year it increases by one-tenth its weight; and from then on, the increase is tolerably constant up to the eighth year for girls, and the tenth year for boys, at about 1,500–1,800 grams per annum. The increase in height takes a parallel course. The greatest changes occur in the suckling. At birth the height is 50 centimetres, which is about one-third that of the adult. At twelve months it has increased by 20 centimetres (40 per cent), more of this increase going to the lower than to the upper half of the body. In the second year the increase is 10 centimetres (15 per cent); in the third, 7 centimetres (8 per cent); and from then on, it is about 5 centimetres annually. At five years the height has doubled, and at fifteen tripled itself. This for boys. Girls are smaller, and reach their maximum earlier. The maximum height of army recruits falls between the twentieth and the twenty-second year, and is 170.5 centimetres. If in growing the body retained the proportions of the several parts, the weight of the adult would be twenty-seven times that of the new-born child, inasmuch as the adult is three times as tall as the babe, and the volume is as the cube of the height. As it is, the adult weight is only twelve times the original, and this difference shows how much more the growth is in height than in any other direction.

The usual method of obtaining these average results is to measure groups of children of certain ages, and take the mean result.

Another method is to observe the same children, and measure and weigh them for many years. The latter is the more troublesome, but the inference from it is more immediate; though the former, when based on sufficiently large numbers, gives reliable results. Dr. Landsberger has been measuring a large number of children in Posen, Germany, and always the same children, since 1880, — a period of six years. The measurements have been made always between the 5th and the 15th of May, at the same time of day, in the same place, and with the same instruments. The average period covered is from the sixth to the thirteenth year. One curious result is, that the social factor as between the rich and the poor is a much more important one than the racial as between Poles and Germans. The rich children come to school taller and heavier than the poor ones, though their increase after getting to school is not more rapid. This long-lasting effect of early care is much more conclusively shown by the figures of another observer, Russow, who has tabulated the heights and weights of children from their second to their eighth year, distinguishing between those that were naturally suckled and those that were artificially reared, and throughout all this period shows a balance in height and weight in favor of the former.

Perhaps the most original investigation in this field is that of Dr. Malling-Hansen, director of the institute for the deaf-and-dumb at Copenhagen; the measurements being made on the children of that institution ranging from nine to fifteen years in age. The weights of these children show three marked periods in each year: there is a period of maximum growth in weight extending from August to the middle of December, a period of mean growth in weight from then to the first of April, followed by a period of minimum growth in weight back to August again. During the period of maximum growth in weight, the daily increase is three times as great as during the period of mean growth; and almost all that is gained in the latter period is lost in the period of minimum growth. With regard to height, these periods are equally evident though not coincident. In Copenhagen the period of minimum growth in height is from August to the end of November; the mean period, from then to March; and the maximum period, from March to August. In the maximum period the daily increase in height is two and a half times as great as in the mean period, and in the latter two and a half times as great as in the minimum period.

The period, then, at which the general increase of the body is going on is from the end of March to December; and within this period there is a period of maximum increase in height and a period of maximum increase in weight. During the period of most rapid increase in weight, the increase in height is the slowest of any in that period, the times of mean growth of height and weight about coincide, and the period of maximum growth in height is a period of comparative rest for the weight. The height-periods begin and end about fifteen days before the weight-periods. The height first has a period of minimum growth, then a period of mean growth, then its maximum growth, and then suddenly falls back again to the minimum rate of growth. The weight, however, begins with a minimum rate of growth, passes at once to its maximum, and then slowly falls through the period of mean growth back to the minimum again. The growth in weight varies more than the growth in height. An increase of 1 centimetre of height corresponds to 2.84 kilograms during the period of maximum growth in weight, but only to .48 of a kilogram in the period of mean or minimum growth. The increase of weight in the maximum period is essentially a growth in stoutness, and the loss of weight during the period of minimum growth is a decrease in stoutness. In the period of maximum increase in height the increase in stoutness is at a minimum, and during the period of least increase in height is at a maximum. A practical lesson to be derived from the knowledge of these periods is to have as large as possible a share of the period of general greatest growth fall into the vacation time; for then the body has less strain upon it, and is in general in the best condition for growing. The Swedes and South Germans are accordingly right in giving their children two or two and a half months vacation, from July to the middle of September, thus including a good share of the greatest growth period.

Dr. Malling-Hansen has also attempted to make out shorter periods of twenty-five and seventy-five days of variations in growth,

which he regards as due to the changes in the climatic conditions, but this is not as yet securely established. His study of the height reveals some very interesting points. It is well known that we are longer when we lie down than when we stand up, and this difference may be as much as a centimetre. So, too, after a long walk, when the weight of the body has compressed all those parts that furnish room for contraction, the height is smaller. Twenty-two boys, thirteen to sixteen years old, were measured at different times of day. During the hours of leisure, from 6 to 8 A.M., a boy lost, on the average, 4 millimetres in height; while resting on the school-bench, from 8 to 9 o'clock, he gained .3 of a millimetre; during the instruction, from 9 to 10, he loses 1 millimetre; during the recess, from 10 to 11, the loss in height was 3 millimetres for each boy; from 11 to 12 during school-hours the body expands by 2 millimetres, but in the next hour in school loses .4 of a millimetre; in the leisure time from 1 to 5 o'clock the body loses 3 millimetres. In general, from 6 A.M. to 5 P.M. there is a loss of 9 millimetres; from 5 to 9 P.M. there are variations; and from 9 P.M. to 6 A.M. there is a gain of 9 millimetres. These measurements were taken during the winter months. The daily variations in weight were also observed. From the end of the chief meal, at 2 P.M., until 9 o'clock, each boy loses .13 of a kilogram, and from 9 P.M. to 6 A.M. there was a loss of .57 of a kilogram: of this, .28 of a kilogram was due to perspiration and exhalations, and the rest to excretions. From 6 A.M. to 1 P.M. there was a gain of .11 of a kilogram, and dinner added .59 of a kilogram. It is very much to be hoped that the custom of taking a variety of this kind of measurements will become widespread, and systematic attempts be made to extend and collect such observations.

SCARLET-FEVER REPORT.¹—IV.

S. H. DURGIN, M.D., Boston, Mass., health commissioner, reports that the law of Massachusetts requires reports of scarlet-fever to be made by both the attending physician and the householder. Boards of health should verify the diagnosis, and cause strict isolation and thorough disinfection to be practised. Dr. Durgin believes that isolation can best be carried out in hospitals. Inasmuch as these measures are often successful in preventing the spread of the fever in schools and families, he thinks they would be equally efficacious in preventing its spread in a community. He thinks the use of drugs to prevent well persons from contracting the disease to be nonsense.

Mary B. Moody, M.D., New Haven, Conn., relates the following incidents, which have come under her personal observation, as showing the communicability of scarlet-fever: 1. Two children received a call from a little playmate who was affected with scarlatina. The disease was so light that it was not recognized for some days. The exposed children suffered from the anginose variety, but did not come down for six weeks. They were very ill, and attacked within a few hours of each other. 2. A young physician, male, called upon a lady directly after attending a scarlet-fever case, and without ablutions or change of clothing. She had unmistakable scarlet-fever two weeks later. Dr. Moody believes that in hyposulphite of sodium we have an agent which will protect well persons from contracting the fever when exposed. She says, "Hyposulphite of sodium in solution has appeared in two cases, at least, which came under my observation, to have sufficient protective power to enable a sister to attend the funeral of a brother dead of the disease, and to enter his two-roomed house, which was infected by it. She went against protest into what seemed certain exposure, was sixteen years of age. All the other children of the family had it, four or five of them within two months of the first case. The late Dr. Thomas F. Rochester of Buffalo related to his classes in college instances he had personally known where contagion of scarlet-fever was carried in clothing. One lady wore a wrapper to assist in caring for the daughter of a friend where she was visiting, who was ill with scarlet-fever. When her visit was ended, she put the wrapper in her trunk and went to the house of another friend, who had a daughter about the same age of the one to whom she had recently ministered. There were no cases of scarlet-fever in the vicinity, nor had there been for a long time.

She wore the wrapper soon after her arrival. In a few days the little girl sickened with scarlet-fever and died."

Fred. K. Smith, M.D., Calumet, Mich., says, "I have seen repeatedly successive cases, occurring in families at intervals of a few days or one or two weeks, where it has apparently been communicated from one to another. In one case which I observed, a young lady, having a mild attack in Michigan at a place where it was epidemic, went home to Ohio about two weeks after the beginning of the attack. Within two weeks after her return, her sister was attacked with the same disease, no other cases existing in the neighborhood at that time. The weight of evidence indicates that a scarlet-fever patient may communicate the disease to others for a period of six weeks from the beginning of the disease, and, if complete disinfection is not then accomplished, for an additional period from virus retained on the skin and clothing." Dr. Smith thinks that placards should be affixed to houses in which scarlet-fever exists, and that the occupants should not be permitted either to make or receive visits.

D. L. Phares, M.D., Agricultural and Mechanical College, Agricultural College P.O., Miss., narrates a case in which a gentleman spent about a week helping to nurse a case of scarlet-fever. When the patient died, he rode about twenty miles, taking his clothing with him, to spend some days with his sister and her children. In a few days the children took the disease, and part of them died. No other means could be discovered of taking the disease.

W. W. Daniells, Madison, Wis., reports the following case: "A lady nursed her sister's children in a house adjoining mine, and when she went home (after a thorough bath) wore no clothing that had been near the house where the sickness occurred; yet her own child, who had not been otherwise exposed, took the disease, the germs having been probably carried in the hair, which had not been cleansed."

Charles Schäffer, M.D., Philadelphia, Penn., reports the case of a young nephew of his, less than a year old, who contracted the disease in a house where a death had occurred three months before, and was supposed to have been disinfected. In another instance two children of a friend died from the disease after returning to their home several weeks after the recovery of another member of the family from the fever.

Charles N. Chapin, Providence, R.I., superintendent of health, makes the following statement as showing the practice of the health department in that city: "At present we placard houses; exclude children of household from school, Sunday school, etc.; distribute circulars of information; forbid public funerals; and fumigate with sulphur. We should, in addition, fumigate all textile fabrics, etc., with steam, and have a hospital for the treatment of those cases which cannot be isolated at home. Our rules are fairly well complied with; and it is possible, that, if they could have been strictly enforced at the beginning of this epidemic in August, it might have been stopped. But I do not feel at all sure but that the only way to prevent the spread of this disease is to remove every case to a hospital, or else put a guard around every infected house, and prevent every possible contact with the community. I shall be pleased to give you the results of our efforts later in the season, whether they are favorable or not. Thus far the cases reported per week have been as follows:—

	August.				September.				October.				
Date.....	6	13	20	27	3	10	17	24	1	8	15	22	29
Cases	0	4	4	7	9	3	8	33	49	58	56	37	34

"Reports of cases should be made by physicians, because they are cognizant of the majority of cases, and because they can recognize the disease. Physicians should be licensed by State boards of health. The physicians should be paid for this service by the local government. When a physician is not employed (and perhaps in all cases), the head of the household should be obliged to report. This is the law in this State. But it is by the rules of the board of health in this city that the reporting by physicians is made compulsory. They are not, however, paid for this service. About ninety per cent of all cases are reported by physicians. We learn of the others through the assistance of school-teachers chiefly. Probably very few cases now escape us."

¹ Continued from *Science* of Jan. 13, 1888.

John M. Scudder, M.D., Cincinnati, O., believes that scarlet-fever may be communicated by milk. He has traced one such instance, where the milkman's children had the fever, and it was communicated to customers at the isolated points. He thinks this, however, is rare. Dr. Scudder further adds, "I had one case in which the disease was communicated five months after recovery, by playing with dolls and toys which had been locked in a drawer during that time. In another case, in the family of Mr. ———, the time was eleven months. There could be no mistake in either case. In another case the circumstances pointed to a contagion fourteen months old." He thinks that boards of health should distinctly mark each house 'Scarlet-fever Within.'

A. P. Richardson, M.D., Walpole, N.H., sends the following case, which came under his observation: "A child had scarlet-fever in Keene, N.H., and late in the stage of desquamation visited a friend in Walpole, N.H., slept with a child who died of malignant scarlet-fever a few days after, being sick only a few hours." He adds, "I remember the mother of a child which had died of scarlet-fever sent some of the deceased's playthings to a child in another family, the latter being sick with the disease soon after."

W. S. Strode, M.D., Bernadotte, Ill., writes, "In March, 1884, scarlet-fever was brought to Bernadotte by a family (resident) visiting another family six miles distant, in which a small child had just taken sick, said sickness being accompanied by a red rash. A little boy four years old of the above family, after a few days, took sick, the sickness being accompanied by a rash, not very prominent, and died in twenty-four hours from the time of the first symptoms. The physician diagnosed the case as diphtheria, and a number of children were permitted to see the corpse and attend the funeral. Two or three days later, the remaining children (two younger) took sick with the same symptoms, and I was sent for, and at once proclaimed it scarlet-fever, and immediately set about to guard against its spread by having the school stopped, and all families that had been exposed isolated. There were nineteen cases that broke out with the disease, all in families that had been exposed to the first case. No more deaths, and not all the children in some of the families contracted it either, though exposed to it for days. I would say, that, at the time of the above epidemic, my family consisted of four children, aged respectively one, six, nine, and twelve years. I took ordinary precautions, after visiting the families infected, to guard against carrying to my own family or that of others, by changing my outside apparel at my office, washing, etc., and by going about in the open air for some time. My children did not become infected. Three weeks later, that is, after all the cases had recovered, it was again brought to town by a visiting family; this family unknowingly being exposed to scarlet-fever on the train, and two children breaking out with it in two or three days after they arrived. But previous to this time the lady that the mother of the children was visiting put on her shawl, and came to my house, and, without removing her shawl, took my baby in her arms and held him for some time. In four days he broke out with a typical scarlet-fever rash; and in from four to seven days from this time the three older children of my family also broke out with it. The three children of this lady also had it, making nine additional cases. All recovered. By a strict quarantine the contagion did not spread any further."

G. P. Conn, M.D., Concord, N.H., member of the State Board of Health, says, "In reply to your inquiries, allow me to say that over thirty years of dealing with scarlet-fever and kindred disorders has not convinced me that I know all about its origin or its development. On the contrary, I am constrained to add that I fear we have not solved the problem, nor are we likely to do so at present unless by accident. I have found so many instances where it could not be traced, and in other cases where one in a large family of children would have the disease while all others would escape, that I feel that my knowledge is hardly worth repeating. I do believe that there is a vast difference in the degree of cases, and that in some instances it arrives at a development where none unprotected will escape, while in other cases none will be made ill except the more susceptible. Unfortunately, the profession are not yet able to determine to which class a given case belongs, and therefore it is necessary to carefully isolate all in order to be sure."

George J. Engelmann, M.D., St. Louis, Mo., relates the following

striking cases: "Mr. H., living in Belleville, Ill., had a child sick with scarlet-fever, bade the child good-by, drove fourteen miles in an open buggy to a farm, shook hands twice with a young lady there, and took dinner with the family. He saw no more of the young lady, but was busy outside with the father during his visit. There was no scarlet-fever in the neighborhood of this farm, yet that young lady, twenty-one years old, the youngest in the house, took the scarlet-fever, infected by Mr. H. The clothing of children who died from scarlet-fever in Denver was taken to the house of Dr. R. in St. Louis, after having been put away in camphor for the winter, and gave scarlet-fever to all of Dr. R's children eight months after the decease of the children in Denver."

H. Hartshorne, M.D., Philadelphia, Penn., reports, "I know of no valid reason for believing that scarlet-fever ever arises, at the present time, except by contagion from a pre-existing case. I have no doubt whatever of the contagiousness of scarlet-fever; although, as in the case of other communicable diseases, some persons exposed may escape being affected by it. Having withdrawn from the active practice of medicine, I cannot give precise details of such cases coming under my personal observation; but they have been amply sufficient to confirm me in a strong conviction on the subject. When a person who has had scarlet-fever ceases to communicate it, must depend partly on the measures taken—by repeated bathing, change of clothing, etc., after recovery—to remove all remnants of the eruption. When such care is taken, thirty days from the beginning of the attack ought to suffice. With average care, it had better be made forty days. I have had direct information of several instances in which a house, not disinfected after scarlet-fever had been in it, gave evidence of infection remaining in it several months after the recovery of the patient so affected in it. I believe (from the above-mentioned reliable information), that, without disinfection, rooms are more liable to the retention of the contagion of scarlet-fever than persons who have had the disease. In populous cities the dissemination of scarlet-fever is apt to be so wide, and the means of communication so unavoidable, that no benefit is likely to result from requiring cases of it to be reported by physicians or others to boards of health. Boards of health, if such reports are received, should advise the sequestration of the patients as far as practicable, especially from other children, and, on their recovery, should insist on thorough disinfection. The spread of scarlet-fever could be diminished, at least, very much, by isolation of patients during the attack, disinfection of bedding, clothing, and rooms, etc., on recovery, and all measures of sanitary improvement (in cleanliness, ventilation, etc.) which lessen the prevalence and mortality of *all* contagious, infectious, and epidemic diseases. I doubt very much whether any thing can be done, by the use of remedies or otherwise, to prevent well persons from contracting scarlet-fever when they are exposed to it. It is *a priori* improbable, though not impossible. When a medical student, residing in a house in which there was scarlet-fever, I took belladonna for several days, and escaped the attack; and I have known another instance of the coincidence of the use of belladonna with escape or exposure. But the contagion of scarlet-fever is more uncertain as to individuals, than that of measles or small-pox; that is, a greater number of those exposed to it may escape it than either of them."

THE TEACHING OF DRAWING.

IN a paper on the teaching of drawing, read before the College of Preceptors by T. R. Ablett, Esq., and reported at some length in the *Educational Times*, the educational value of the subject is brought out with a strength and clearness that render the paper of more than usual interest to our educators. Mr. Ablett considered drawing simply as a means of education, and explicitly set aside any treatment of it as an accomplishment or as a training for artists. He pointed out that the mode of instruction in drawing, taken in this sense, would naturally differ from that followed when the production of artists was aimed at, and must be adapted to school-children most of whom have no special aptitude, and little time for practice. To raise drawing to its proper position, we must prove that it is one of the bases of education, and should be taught to all children, whatever their future vocation. We must also prove that it can be taught by collective methods as readily as arithmetic

or reading. The speaker then summarized the educational advantages of drawing, as follows: I. It brings into active use certain faculties and powers of the mind, which can be reached to an equal extent in no other way. For example: correct ideas of proportion and scales are developed, the graphic memory is improved, accuracy in observing is promoted, the powers of description are increased. Although drawing is a universal language, yet few are able to use it. II. Drawing facilitates the acquirement of the simple elements of education. For example: spelling demands a power of remembering the look of words, since in English the sound is not always a trustworthy guide. The improvement of the graphic memory will aid in learning to spell. Again: a child may be taught to draw before it is possible or desirable that he should learn to write. The pen is the worst of drawing-tools, and should not be the first to be put into the hands of children. The earlier use of simpler drawing instruments will facilitate learning to write. Again: drawing teaches the arithmetic of space, as figuring teaches the arithmetic of numbers. There is no reason why the child should be taught one and not the other. The arithmetic of space may be taught as soon as a child can use a ruler and can understand something of drawing to scale. Furthermore, facts which in figures make no appeal to the mind can be readily grasped by means of drawing, especially if these are made by the pupils themselves. In all these ways drawing actually improves the mind's capacity for learning other subjects.

As a rule, the teaching of drawing is in a very backward state; for art teachers, so called, as a rule are poor teachers, and the whole instruction in this branch has been hampered by the prevalent belief that no one should learn drawing who has not a special talent for it. Then, too, collective methods of teaching have not been properly developed. To accomplish the last-named object, it is essential that the members of the class be so arranged that each one can have approximately the same view of the object to be drawn. Object-drawing is the most difficult branch of the subject to be taught collectively, but it can be done. For good class-teaching of object-drawing, three vital principles must be observed: (a) the object must be a large one, that all can easily see; (b) all members of the class must obtain approximately the same view of the object; (c) the teacher must be acquainted with class management and with the subject, and able to demonstrate principles and methods with ability and enthusiasm.

Mr. Ablett then presented the pedagogic aim of drawing in the different grades. In Class 1 it is, (1) to develop accurate observation, (2) to connect writing and drawing, (3) to ward off color-blindness, (4) to cultivate the perceptions, (5) to teach outline-drawing from real objects which present no difficulties in foreshortening; in Class 2, (1) to call attention to the difference between the real and apparent forms of simple objects and curves, (2) to cultivate the graphic memory, (3) by the dictated drawing to insure a knowledge of art terms and give facility in working from verbal instructions; in Class 3, to teach the leading principles of drawing in outline from the things of every-day life; in Class 4, to develop a useful power in drawing from rounded objects (plants and casts) that will serve as a stepping-stone between drawing from simple objects and drawing from the antique; in Class 5, to give a knowledge of shading from real things (this will assist the pupil materially in acquiring the principles of painting, should he ever want to do so); in Class 6, to enable those who have passed through the preceding classes to begin the study of the higher branches of art.

From the character of the discussion that followed Mr. Ablett's excellent paper, it is easy to see that the English schoolmasters are far behind our own, so far as understanding and appreciating drawing are concerned.

CASE SCHOOL OF APPLIED SCIENCE.

LEONARD CASE, the founder of Case School of Applied Science, was one of the few wealthy men who continue in after-life the literary and scientific work begun in college. Inheriting a large estate, he was relieved from the necessity of turning his acquirements to account in making a living, but he was nevertheless a lifelong student. He was one of a group of young men, who, under the leadership of the famous Dr. Kirtland, formed the Cleveland Natural History Society, and accomplished such excellent work, as is

shown by their publications, and by the large collections now in the rooms of the society.

In general literature he was a careful student, and he was a writer of marked ability. His natural tastes, however, led him to give most attention to mathematics and natural science.

Prizing education and culture, he determined to do what he could for their advancement. His first gift to Cleveland, in pursuance of this idea, was Case Library,—a splendidly equipped and endowed institution, and, by the courtesy of its trustees, a valuable adjunct to the School of Applied Science. The magnitude of this public benefaction was, however, far surpassed by his later and more munificent gift for the school.

His deep interest in his favorite studies led him to desire that others should have an opportunity to pursue them under even more favorable conditions than he himself had enjoyed, and to that end he determined to found and endow a scientific school of high grade.

On Feb. 24, 1876, he executed a trust deed, setting apart certain lands to endow a scientific school in the city of Cleveland. In the trust deed he directed the trustee, Henry G. Abbey, "to cause to be formed and regularly incorporated under the laws of Ohio, an institution of learning, to be called the 'Case School of Applied Science,' and located in said city of Cleveland, in which shall be taught, by competent professors and teachers, mathematics, physics, engineering (mechanical and civil), chemistry, economic geology, mining and metallurgy, natural history, drawing, and modern languages. . . . And without intending to make it a condition or limitation of this conveyance, or any binding restriction upon the power of such trustees, the said grantor does hereby recommend to them to hold said property without alienation, and apply the rents, issues, and profits thereof to the uses and purposes above, and that the expenditures for such institution be not permitted to exceed the annual income derived from said property."

The value of the property thus dedicated to the cause of scientific education was about a million and a half dollars. It consists of real estate, a considerable part of which is centrally located in the city. One parcel is the City Hall Block, including both the building and the land; another is an entire block of land cornering on the City Square; and still others, of blocks of land less centrally located. The trustees have followed the recommendation of the donor, and have adopted the policy of leasing the land, so that a secure and increasing income to the school is assured.

After the death of Mr. Case, Jan. 6, 1880, the school was incorporated, and in 1881 instruction was begun in the old Case homestead near the City Square. The addition of new departments of instruction, and the rapid accumulation of apparatus and appliances for the laboratories and class-rooms, soon rendered more ample accommodations necessary. An admirable site was procured for the school on Euclid Avenue, opposite Wade Park; a commodious building was erected from designs by John Eisenman; and in the fall of 1885 the school took possession of its new quarters.

On Wednesday, Oct. 27, 1886, the new building and all of the valuable collections it contained were destroyed by fire. The trustees and faculty of Adelbert College generously offered rooms for the use of the school in a dormitory building standing very near Case School, and recitations and lectures were resumed on the following Monday, work having been suspended but three days. A temporary laboratory was erected for immediate use, instruments and apparatus were procured for the class-rooms and laboratories, and the work of the classes proceeded with comparatively little interruption.

The school is greatly indebted to the well-known mechanics, Warner & Swasey, the Brush Electric Light Co., and several citizens of Cleveland, for valuable assistance in refitting the laboratories, and in replacing the library and the collections in geology, mineralogy, etc.

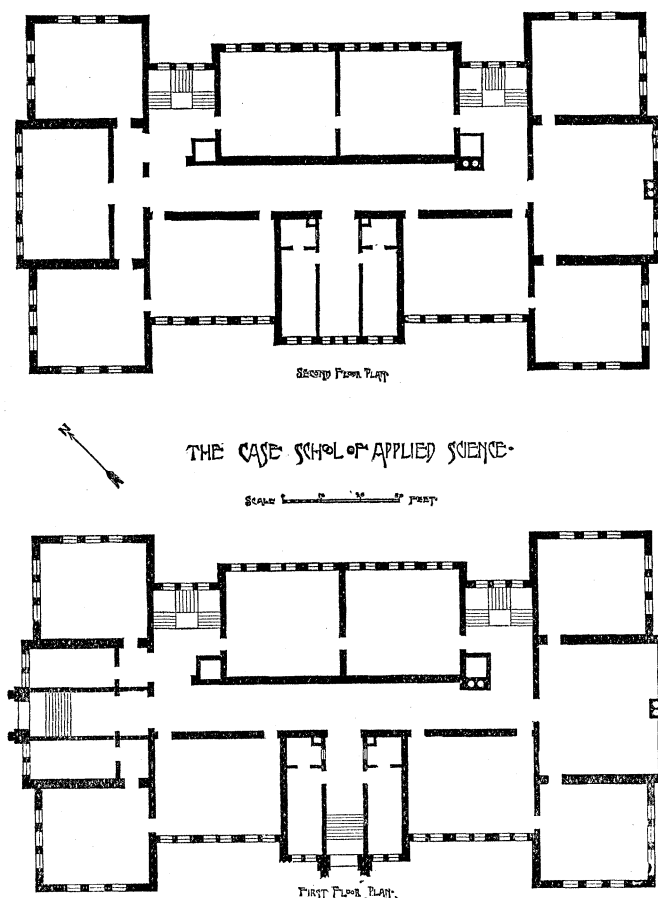
Meanwhile the reconstruction of the burned building was pushed as rapidly as possible. The trustees, with characteristic Western energy, ordered its reconstruction before the fire was entirely extinguished, and the contractor began work while some of the stones were still too hot to handle.

The building, as left by the fire, consisted of bare walls, badly

broken, with some of the dormers and gables still standing in a damaged condition. Upon inspection it was found necessary to take down all above the main cornice, and about half of the walls. The material of the walls below the cornice was found to be in such good condition that all of this work was replaced according to the original design, except the tower. The entrance to the tower, not being badly damaged, was taken down, and replaced with only a slight alteration in the roof. The tower and every thing above the plancier of the main cornice are of different design from the corresponding parts of the original building. Before any new work proceeded, the board of trustees, in connection with their architect, Clarence O. Arey, discussed each point, so as to obviate as far as possible the defects that had been found in the former building.

The outside walls of the building are a combination of rock-faced ashlar and brick backing, except in the dormers, which are of solid stone. The stone used is Amherst, O., sandstone. All of the partition walls are of brick. The floors were formerly of wood, but are now to be thoroughly fire-proof,—of iron girders and tile arches. The roof was formerly of light timbers close together. Now it is built of heavy timber, according to the 'slow-burning' method of construction, and is slated with Maine slate. The flashings and gutters are all of copper. The ridge-rolls, and front and under faces of the upper mouldings of the cornice, are of galvanized iron. This is used only where it is easily replaced or very little exposed. The tower is now temporarily roofed with a flat, pitched roof at the top of the stone-work, and only part of the carving shown in the drawing is completed.

A general view of the reconstructed building is shown in the accompanying illustration. It has a ground plan 161 by 92 feet, and



consists of three stories besides the basement and attic. The basement is arranged for heavy machinery, laboratories, and workshops. The remainder of the building is designed for class-rooms, drawing-rooms, and cabinets for collections, etc. The boiler-room is outside of the walls of the building, to avoid danger from fire or explosion. The chemical laboratory, which also contains the furnaces for assaying, is in a separate building. Every precaution has

been taken not only to render the building fire-proof, but to keep fire entirely out of it.

The educational interests of the school have been carefully attended to. The school is well organized, and is supplied with a strong corps of professors.

The preparation required for admission is such as is given by the best high schools and academies. The studies pursued in the school consist principally of modern languages, mathematics, natural history, natural science, and engineering. The school provides courses leading to the degree of bachelor of science (B.S.) in civil engineering, mechanical engineering, mining engineering, electrical engineering, physics, and chemistry. While advanced theory occupies an important place in all of the courses, the methods of instruction incline decidedly towards the practical. Laboratory, shop, and field work are prominent features of the various courses.

Original investigations both by professors and students are constantly in progress in the various departments, and some of the published results are valuable contributions to the advancement of science. Just at the present time scientific men are deeply interested in some investigations now in progress in the school, preliminary statements in regard to which have already been published.

The city of Cleveland affords unusual advantages for a scientific school. It is an important railroad centre and lake port, and offers excellent opportunities for studying the various engineering problems connected with transportation. It is the centre of extensive mining and manufacturing interests. It has chemical works, steel-works, rolling-mills, furnaces, forges, machine-shops, and manufactories of electric machines and appliances, and of various other sorts. These, in many cases, are the most extensive of their kind in this country, and their variety is noteworthy. Almost all varieties of engineering structures and of manufacturing processes can be seen in the city, and are available for examination and study by the students. These advantages, and their influence in insuring the prosperity and usefulness of the school, were fully appreciated by Mr. Case, and had no slight weight in influencing him to found the school.

ETHNOLOGY.

Prehistoric Researches in South-eastern Spain.

Two Belgian engineers, Messrs. Siret, are about to publish the important results of their extensive archæological researches in Spain, which extend over the coast from Carthage to Almeria. The oldest remains belong to the neolithic period. There is not a trace of metal to be found in these ancient habitations. The implements consist of polished axes, perforated shells, pottery, grinding-stones, chipped flints, and primitive walls of stone. In another class of sites which belong to a more recent period, remains of copper and a few bronze implements were found. The inhabitants lived in stone houses, the stones being cemented by earth. Flint implements, particularly arrow-heads and knives, ornamented pots, bone points, and numerous copper celts, were found in the houses. Cremation was practised to a considerable extent by the people of that period. Copper ores and scoræ proved that they practised the art of smelting.

In a later period fortified villages, with walls made of stone and mud, were built on the tops of the hills. In the space surrounded by the walls, the ruins of burnt houses, implements, remains of grain which was kept in clay pots, cloth made of broom, and hand-mills, were found. Flint was used only for making saws. The dead were buried in natural caves, or in stone boxes under the houses or near them.

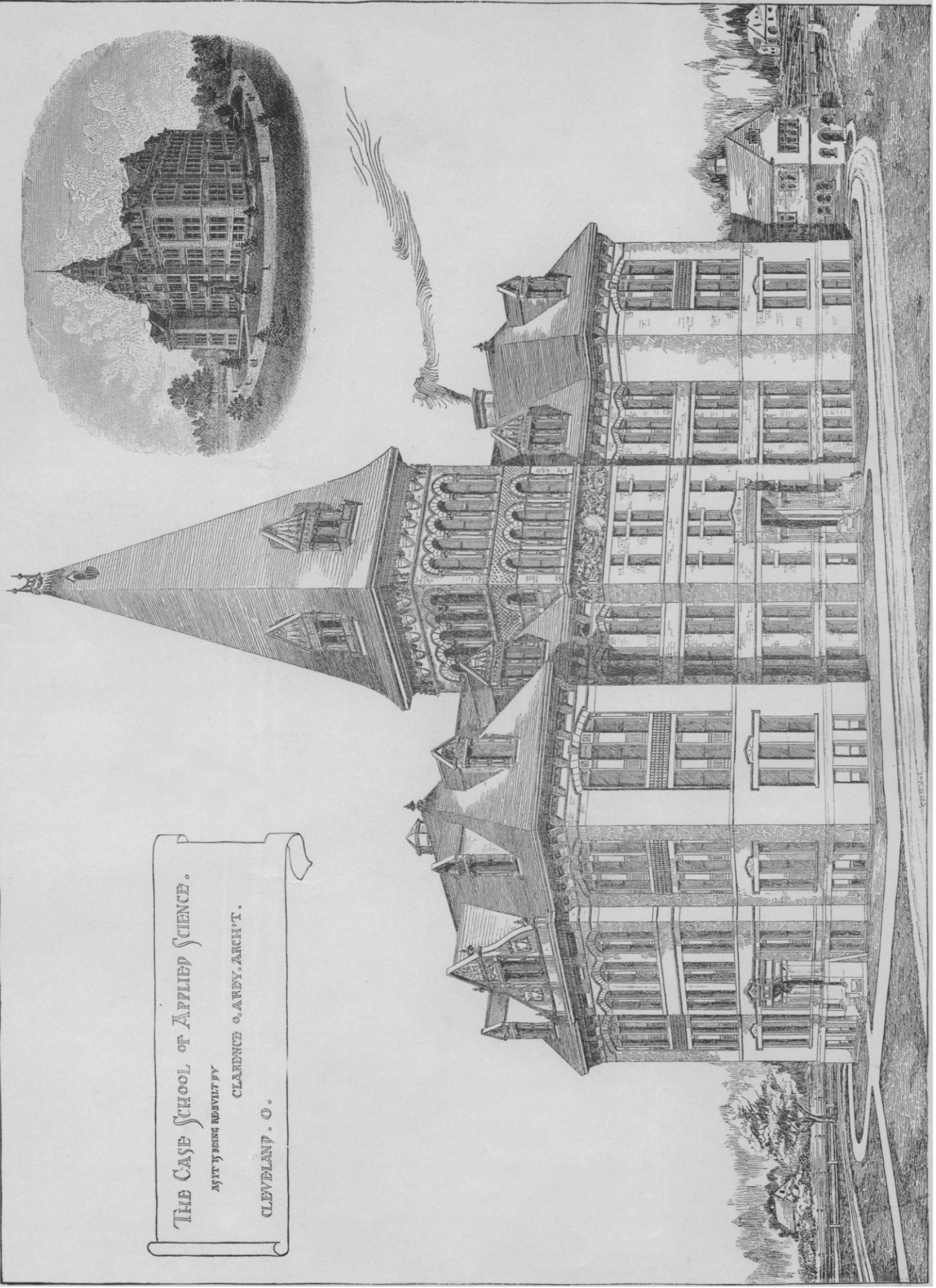
At the end of the copper period the inhabitants still lived on the tops of steep hills, in fortresses. The implements consisted of the same material, but, besides, moulds for casting copper, ivory, gold, and silver were found. Over twelve hundred graves belonging to this period were opened. All of them were situated in the houses, and consisted either of small chambers of stone, of stone boxes, or of huge clay pots with rounded bottom and wide mouth. The largest of these are over three feet long and two feet wide. The skeletons are doubled up, hands and knees being pressed against the chin. Sometimes husband and wife are found in the same urn. The study of this vast amount of material will be highly interesting.

THE CASE SCHOOL OF APPLIED SCIENCE.

AS IT IS BEING REBUILT BY

CLARENCE O. AREY, ARCH'T.

CLEVELAND, O.



Virchow points out that part of this ancient culture is probably due to Phœnician influence (*Zeitschr. für Ethnologie*, 1887, No. v.).

PREHISTORIC SKATING. — As is well known, the art of skating is a prehistoric one. In many parts of Europe bones of domesticated animals have been found which had been used as skates or as runners of small sledges. It is of considerable interest to learn that similar implements are found still in use in several parts of northern Germany. In the *Journal of the Berlin Ethnological Society*, sledges are described which consist of a board resting on the bones of a horse. But, besides this, skates are used the runners of which consist of the lower jaw of cattle, the curvature of the lower side serving admirably the object of the skate.

BOOK — REVIEWS.

The Early History of the English Woollen Industry. By W. J. ASHLEY, M.A. Baltimore, American Economic Association.

"I CANNOT but be sensible," says the author, "of the honor which the American Economic Association has done me by permitting me to join in their work." The members of the association might say in reply, that they are sensible of the honor which Mr. Ashley has done them in consenting to take part in their work. The co-operation of English and American students in economics is most encouraging; at least, we on this side of the water appreciate very highly such papers as the one which forms the subject of this notice, or as lately appeared in the *Quarterly Journal of Economics* from the pen of Professor Foxwell of Cambridge.

There are two points of interest in the preface to this monograph. In the first place, Mr. Ashley explains, very properly we think, the revival of economic studies in the United States. This country, he says, "exhibits the forces of competition and capital working on a larger scale than elsewhere, and in a freer field, uncrossed by any of the influences of decaying feudalism." England is no longer "the classic land of capitalistic production," as Karl Marx once called her: that honor now belongs to the United States. It is, then, chiefly because economic questions have lately come to be of such importance, that Americans are studying them with earnestness; and it is because the field offered for their solution is comparatively free that European peoples regard that study with peculiar interest. But, in the second place, our author cautions American students against being too greatly influenced by the teachings of German universities. "No observer of German thought," he says, "can fail to see, that, though most vigorous within its range, its range is exceedingly narrow. German writers seldom realize the atmosphere of individual initiative in which English and American thought moves." And he adds, "American teachers will be compelled, by the traditions of their country, the needs of their pupils, and the criticisms of their opponents, to give due weight to the forces of competition and to the arguments of more recent English economists." This view is certainly correct. There is a radical difference between the German and the American. Whether we consider political or industrial affairs, the closer we observe, the more strongly do differences impress themselves upon our minds. German thought does not fit American affairs. The only lesson of abiding importance brought from the universities on the continent pertains to methods of investigation.

Turning now to the monograph itself, we find it to be an eminently satisfactory sketch of the history of the English woollen industry from earliest times to the period of the great inventions. The peculiar interest in such a sketch lies in the fact that the history of the woollen industry fairly represents the development of all industries. Whether we consider the relation of artisans to early local government, or the internal organization of trades, or the social and political influence of changed methods of doing work, we find a true picture in the history of the woollen industry. The author divides his sketch into four parts. He first treats of the establishment of the guild system; second, of the education of the English workman by the importation of foreign skilled workers; third, of the rise of the merchant class; and, fourth, of the growth of the domestic system. For us in this country the part which treats of the separation of the merchant class from the main body of workers is perhaps the most instructive. Americans pride themselves

on being cosmopolitan, and it is true that their love of travel makes them familiar with the existing habits and customs of many peoples; but when it comes to history, their minds are essentially provincial. They are prone to regard the nineteenth century, out of which their minds have never travelled, as the natural and therefore the permanent order of society. Their conservatism is, on this account, unreasonably strong. It would be a good thing if every business-man could be brought to see that there once existed a successful industrial society, in which a separate class of traders was not known. They then might regard with less suspicion certain tendencies in modern times looking towards further industrial changes.

But professed students of history, as well as business-men, will find in this monograph much instruction. It is a common error to say that machinery and steam-power are responsible for the creation of a clearly defined laboring-class. Mr. Ashley shows that such an assumption is not correct. His sketch closes with the establishment of the 'domestic system' of industry, but the liberties and rights then exercised were very nearly the same as those which laborers now enjoy. It needed only the great inventions to fully establish the 'factory system' as we now know it, and to bring about the era of great industries. Failure to recognize that the social position of the workman was quite the same before and after 1760 is responsible for many misinterpretations of industrial history.

In closing we can only say that American students are always grateful for reliable information on English industrial history. They feel that the society with which they deal is as much the result of English life during the middle ages as is English society itself. But this they cannot study at first-hand, because of paucity of material, and on that account they read with eagerness all that English scholars may write upon the subject. Mr. Ashley, then, has the thanks of American students for his excellent monograph on the English woollen industry.

H. C. ADAMS.

A Plea for the Training of the Hand. By D. C. GILMAN, LL.D.

Manual Training and the Public School. By H. H. BELFIELD, Ph.D. New York, Industrial Education Association. 8°.

Primary Methods. By W. N. HAILMANN, A.M. New York, Barnes. 12°.

Industrial Instruction. By ROBERT SEIDEL. Tr. by Margaret K. Smith. Boston, Heath. 12°.

The Manual-Training School. By C. M. WOODWARD, Ph.D. Boston, Heath. 8°.

EACH one of these books bears evidence in its own way to the educational *Zeitgeist*. Each one, had it appeared ten years ago, would have appealed to perhaps a few score readers: it is safe to say that at this time they will be read by thousands. Educational thought and educational practice are in motion. In all parts of the country and in all grades of schools the signs of progress are seen and its effects are felt. The dominant trait of this progress is a demand for reality in education, for practicality in the widest and best sense of the word. Teach the child to know not merely words, but things, objects; teach him not merely to know, but to use and apply what he knows. Teach him literature, teach him arithmetic, teach him geography, and so on, but also teach him something about the busy, active life of which he is so soon to form a part. Teach him not only to perceive and to remember, but to compare, to judge, to execute, to manage. This, if its opponents did but know it, is the philosophy of manual training; and because this philosophy is so certain and so sound, the manual-training movement is carrying every thing before it. The best educational thought of the country is enlisted in its service; and its advocates are making rapid and successful progress, while its handful of vociferous opponents are asserting that it is useless, crude, and destructive of the school. The success of manual training, and the thought and inquiry it has aroused, call for a literature. All of the books whose titles are given above are in answer to this call.

The first is a handsomely printed pamphlet, the first of a permanent series of educational monographs to be issued under the editorship of the president of the Industrial Education Association of

New York. That association is the recognized centre of the manual-training movement, and in these monographs we may expect to find some able expositions not only of manual training, but of other educational subjects. We notice that Sir Philip Magnus of London, Professor Paulsen of Berlin, Professor Sluys of Brussels, Dr. Hannsk of Vienna, Professor Salicis of Paris, Oscar Browning of Cambridge, Colonel Parker of Chicago, Dr. Channing of Harvard, Superintendent Mac Alister of Philadelphia, Dr. A. G. Haygood of Georgia, and Dr. Wey of Elmira, are on the announced list of contributors; and we await from their pens some of the best educational writing, in a convenient and inexpensive form, that has ever been printed in this country.

The present issue is a double number, and the two papers complement each other. President Gilman writes in an easy, graceful way of the training of the hand, and puts his argument so simply that the veriest novice in educational matters should be able to understand it. His summary of the principles of manual training (pp. 11-13) is very comprehensive, as is the following concise summary of the whole question: "Manual training is an essential part of a good education, whether that education be restricted to the common school or carried on to the highest discipline of technical schools and universities" (p. 13).

Dr. Belfield of Chicago, whose paper forms the second part of the number, makes a powerful argument on the practical side, for the introduction of manual training into the common school. He is able to show from his own experience that better progress is made in other studies with manual training than without it. This is the natural result of the intellectual tonic administered by manual training, as well as of its harmonious development of all the faculties. For the student or teacher who is making a study of manual training, this first number of the Educational Monograph Series is the best possible introduction to the subject.

Dr. Hailmann is a gentleman who has written much, and on the whole well, on education. He is a student and translator of Froebel, and a firm believer in kindergarten methods. In his preface he expressly states that the present work is issued in response to the growing demand among primary teachers for 'busy work' and 'kindergarten methods.' The book is eminently practical, and, so far as it goes, gives an excellent manual-training course for the primary school. We will only say that clay can be used more than the author provides for, and that drawing is the very foundation of manual training. The latter fact seems to have escaped Mr. Hailmann's attention while he was engaged on this book.

'Industrial Instruction' is a translation from the German of Robert Seidel, by Miss Smith of Oswego Normal School. It is a philosophical treatise on manual training, and yet it is sufficiently easy of comprehension to be of assistance to all teachers. An unfortunate disjointedness of style, the usual attribute of German writing, mars the book, but the translator seems to have worked hard to counteract the effect of this. The second chapter, which is entitled 'Errors, Contradictions, and Inconsistencies of the Opponents of Industrial Instruction,' is respectfully commended to the attention of the secretary of the Massachusetts Board of Education and the superintendent of schools at Worcester, Mass.; for both of these gentlemen are not only utterly in the dark about manual training, but they are using their influence on the platform and in educational journals to keep others in the same condition. Seidel shows that the sort of industrial instruction which such persons declaim against has for its aim "principally the development of certain kinds of manual skill, partly by this means to promote domestic industry, partly to prepare for a later profession, to supply trained strength to hand-labor, and thus to elevate it." All sane men who know any thing of public schools unite in insisting that instruction of this sort must not be permitted to find a place. But this instruction is diametrically opposed to that which the advocates and expounders of manual training are upholding. Their manual training is educational, not technical: it develops the judgment and reason, not the power of imitation. Inasmuch as the opponents of manual training in this country seem to be unable to distinguish it from technical instruction, we hope that they will read Seidel's book. Every possible confusion that they can fall into is there explained, and every possible objection that they can raise is there answered.

Dr. Woodward's book is not so satisfactory, but it has a value of its own. It deals with the manual-training school only, considered as a separate institution. This it discusses in full detail, and the theory and practice of the work done at St. Louis are clearly presented. Much of the information as to cost and character of equipment is that which is frequently called for at this time by the school authorities of cities where manual training is being introduced. Almost half the book, however, is given up to Dr. Woodward's various addresses, some of them delivered fifteen years ago. No attempt seems to have been made at editing them, or striking out redundancies and inconsistencies. However forcible they may have been when delivered, they lose much in the present arrangement.

We would close as we began. All of these books are valuable and suggestive. All of them should be widely read, especially by teachers and by parents who have children to educate. All of them approach manual training in the right spirit and with intelligence. The insight of the authors is sufficient to guard against any such ludicrous presentation as that given by Mr. Love in his 'Industrial Education,' a book which we had occasion to notice a few months ago (*Science*, x. No. 247). Taken together, they would form an excellent beginning for a library on manual training.

La Psychologie Physiologique. Par G. SERGI. From the Italian by M. MOUTON. Paris, Felix Alcan, 1888. 8°.

THE flourishing condition of science in Italy has of late been the subject of frequent remark. The universities have filled their chairs with a new generation of men, well schooled in the best methods that the continent can offer, full of enthusiasm for their special pursuit, and gifted with a taste for original research as well as with a comprehensive appreciativeness for the work of others. As the result, there have been appearing from the press of Italy many very valuable contributions to all departments of science, and, what is especially noteworthy, publications tracing distinct novel lines of thought. This has made all scientists look more carefully into the Italian periodicals; has set Frenchmen, Germans, and Englishmen to translating their books; and promises to make a knowledge of Italian quite as requisite a possession for the scientist as a knowledge of French and German.

In the scientific study of mental phenomena the Italians stand in the foremost ranks. They have developed a school of criminal anthropology, setting forth the true nature of the criminal as an aberrant form of humanity, that has gained a world-wide recognition. Their studies of the insane are full of ingenious methods and suggestive results. Some of the best work on the localization of function in the brain has been done in Italy. It is, then, not surprising that they see in experimental psychology the completion of the circle of the sciences, and do all in their power to develop and spread its teachings. Nothing could better illustrate the truly admirable character of their work than this manual of psychology. The author is professor of anthropology in the University of Rome, but his conception of anthropology is broad enough to include an intense interest in all that pertains to the human mind. The volume is written in an entirely modern spirit, and is quite different from the type of text-book that prevails in our colleges.

Perhaps no easier method of indicating the character of its contents could be pursued than that of *résumé* the table of contents. It begins with a terse description of the physiological elements of which the body is composed, with a special description of nerve cells and fibres. Then follows a chapter on the objects of psychology, showing its very intimate connection with physiology and the insensitiveness with which the unconscious shades into consciousness. There is no attempt at abstract, pure distinctions, but a straightforward account is given of what it is that a student of psychology must know and be interested in. Then sensation is treated, and covers nearly a hundred pages. After a general consideration of what sensibility implies, follows a more than usually good and full account of the facts summed up by the psychophysical law. Then the special senses are treated, though not at as great a length as might be desired; a surprisingly large amount of information, however, is expressed in a very few pages. This section is concluded by an interesting chapter on the interpretation of sensations. The next part of the book deals with the intellect, and be-

gins with a description of its anatomical basis. Then follows the portion most similar to current text-books of psychology upon reasoning and ideas, but treated with a scientific appreciation of its import not too frequently met with. A very detailed analysis of the theories attempting to explain the perception of space and time concludes this portion of the book. The third portion of the book gives a convenient account of the facts of consciousness, the laws of the association and reproduction of perceptions, a clear account of the experiments upon the time occupied by the simpler psychic acts, and of the phenomena of unconscious mental action. The fourth part deals with the feelings, and is perhaps too long in proportion to the rest of the work. Here the anthropologist speaks out most strongly, and much matter is inserted not usually considered of prime importance in a text-book. The division of topics is into the individual, the individual-social, the social, and the aesthetic sentiments. The final portion of the book is devoted to the will, and gives a good though brief description of the various kinds of movements, of the expression of the emotions, of the development of will, and discusses from a psychological point of view the problems of free will and of responsibility.

It will be seen that the order of topics is somewhat unusual, but the merit of it can be tested only by actual trial as a text-book. The especial merits of the work consist in the brevity of its statements; in the complete absorption of the scientific method of viewing mental facts, and thus avoiding the fault most common in American psychological text-books of introducing the facts of experimental research, but leaving the whole topic unenlivened by a rejuvenating scientific interest; and in the skill and care of its presentation.

The Italian edition of the work was published in 1879, and, though the French edition has been revised, it has not derived the full benefit of the most recent studies, though this is in many cases no serious omission for a work of this kind. The object of writing the book, the author tells us, was to spread the knowledge of the modern methods of psychological research in Italy. If the students of the Italian colleges can use such a text-book as this intelligently, they must have a sounder scientific training than can be expected from the ordinary junior or senior of American colleges. This is the most serious fault of the book; or it would be, at least, for an English book of the kind. Its brevity has made it technical, and the uncertain character of several of the topics most fully treated requires a well-trained student, under the care of a skilful teacher, to insure its appreciation. Having in view the text-books more or less devoted to the exposition of a scientific psychology, recently published, it can, without hesitation, be said, that for the best selected information, most conveniently and pedagogically expressed, no better four hundred and fifty pages can be found than those of Professor Sergi's book.

NOTES AND NEWS.

FOR a number of years the deficiency in the production of mulberry-silk has drawn the attention of sericulturists to the rearing of the wild silkworms of India, China, Japan, America, and other parts; and a great many reports have been published on these wild silkworms, some of which are already bred in a state of domesticity or semi-domesticity. Reports on this subject have appeared during a succession of years in the *Journal of the Society of Arts*, London; the *Entomologist*, London; the *Bulletin de la Société d'Acclimatation de France*, Paris; and the *Isis*, Berlin. Many of these wild silkworms produce silk of great strength and beauty, and could all be profitably utilized, if bred in their native lands, on a large scale. Specimen cocoons, and carded and reeled silks of about twenty different species, have been sent to the Société d'Acclimatation, and they will be exhibited in the Paris International Exhibition of 1889, together with specimens of the moths and prepared larvæ of the various species. As it is highly important that this exhibition should be as complete as possible, Mr. Alfred Wailly of Tudor Villa, Norbiton, Surrey, Eng., has been requested by the Société d'Acclimatation to send all new specimens he can collect from abroad. He is therefore desirous that sericulturists, entomologists, and all persons wishing to contribute to the formation of this large and interesting collection of the wild silkworms of the

world, should communicate with him, and he requests them to kindly send him, in small or large quantities, specimens of live cocoons, with names of food-plants for each species, whenever possible, and also specimens of the moths. Live cocoons, which are specially required for the rearing of the species, should be sent to Europe from October till about the end of March, according to distance: when sent later, especially when sent from tropical regions, the moths generally emerge during the voyage, and all is lost.

— Some large plumb-line deflections have been brought to light in the Hawaiian Islands, amounting in several cases to almost a minute of arc. During the past year fourteen latitude and three gravity stations have been occupied on the principal islands of the group. Gravity was determined by pendulum observations at the base and summit of Haleakala (ten thousand feet elevation), and also at Honolulu, thereby connecting this work with the work of 1883 done by the United States Solar Eclipse Expedition. About fifteen hundred measures of latitude were made, being an average of more than a hundred measures for each station. The greatest number of pairs observed on any one night was seventy-five. Four stations were made on the island of Hawaii, and as near as practicable they were placed north, south, east, and west of Mauna Loa, the active volcano. One latitude station was also made on the top of Haleakala. The expense of the work was borne by the Hawaiian Government Survey, and the stations were selected by the surveyor-general, Prof. W. D. Alexander. The necessary instruments were loaned by the superintendent of our Coast and Geodetic Survey. Mr. Preston, who made the observations, estimates about a year for their complete reduction and discussion.

— With the object of considering well the various forestry needs of Michigan, the last Legislature enacted a law making the members of the State Board of Agriculture an independent forestry commission. In accordance with this act, the commission will hold a forestry convention at Grand Rapids, Jan. 26 and 27, for the purpose of gathering and disseminating information, and helping to awaken an interest in this important subject.

— Rev. Ebenezer V. Cooper, missionary at Huahine, Society Islands, has communicated to the *San Francisco Bulletin* the death of Andrew Garrett as follows: "Andrew Garrett, a celebrated conchologist, died at his residence on the island of Huahine, Society Group, South Seas, on the 1st of November, 1887, in the sixty-fifth year of his age. For some months past he had suffered from a severe form of cancer in the face, which attack brought about his death. Mr. Garrett was the third child in a family of fourteen, and was born on the 9th of April, 1823, in Beaver Street, Albany, N.Y. His mother was one Joanna van Neau Compeneaux, a native of Belgium, of good education, and speaking several languages; his father being a Francis Garrett, a native of Canada. Both parents lived to old age, the mother attaining seventy-two years and the father eighty-four years. The early life of Andrew Garrett was spent in Vermont State, where he very soon manifested a decided scientific turn of mind. On one occasion, at eight years of age, he left home without warning, to visit a museum some hundred miles away, which having accomplished, he returned home again in safety. He had a great fondness for travel; and to satisfy the longing, he went to sea at the age of eighteen. As a shell-collector he made his first acquaintance with the South Pacific in 1848, and in 1852 he ultimately adopted that island-studded ocean as his special field of research. Since that time Mr. Garrett has visited almost every island of note in the various groups of the South Pacific, spending considerable time in each group. His studies not only embraced shells of the marine, fresh-water, and land orders, but also birds, fishes, and other objects of natural history. He was also a botanist. For one period of ten years he was professionally engaged in the interests of the Goddefroy Museum, Hamburg, during which time was published 'Andrew Garrett's Fische der Südsee,' in six parts, edited by Dr. Albert Günther of the British Museum. Mr. Garrett was also for a time associated with Professor Agassiz. In addition to visiting and residing in every group of islands of the Southern Pacific, Mr. Garrett visited and explored many parts of the Atlantic and Pacific coasts of South

America, the East and West Indies, the Sandwich Islands, and some parts of the united seas. His diligent and learned researches soon gave him a place as an authority among conchologists, — an authority now everywhere recognized. His correspondents were very numerous, residing in all parts of the world. Mr. Garrett's private collection of shells (now on sale) consists of over eight thousand species, comprising over thirty thousand examples, and representing almost every known part of the globe. Of this large collection, Mr. Garrett has himself collected some four thousand species. The deceased was a corresponding member of the California Academy of Sciences and of the Philadelphia Academy of Natural Sciences. The following is a list of Mr. Garrett's principal writings: in Proceedings of Zoological Society, London, list of *Mitridæ* collected at Rarotonga, Cook's Isles; descriptions of two new species of *Separatista*, of two new species of *Cæcum*, of a new species of *Scissurella*; 'On the Terrestrial Mollusca of the Viti Islands:' in the *Quarterly Journal of Conchology*, Leeds, England, 'Occurrence of *Crepidula aculeata* at the Marquesan Islands;' 'Occurrence of *Gadinia reticulata* in Eastern Polynesia;' 'Annotated Catalogue of the Species of *Conus* collected in the South Sea Islands;' 'Catalogue of the Polynesian *Mitridæ*, with Remarks on their Geographical Distribution, Station, and Description of Supposed New Species;' 'Annotated Catalogue of the *Cypræoidea* collected in the South Sea Islands:' in the *Bulletin of the Société Malacologique de France* (Paris), 'On the Terrestrial Mollusca of the Marquesan Islands:' in the *American Journal of Conchology*, vol. vii., 'Descriptions of New Species of Land and Fresh-Water Shells from the South Sea Islands' (plates); 'List of *Viti Bulimus* and Descriptions of new Species' (plates): in the Proceedings of the California Academy of Natural Sciences, 'Descriptions of New Species of Shells inhabiting the Sandwich Islands;' 'Descriptions of New Species of Fishes inhabiting the Sandwich Islands;' 'Description of New Species of South Sea Shells:' in Proceedings of the Academy of Natural Sciences, Philadelphia, 'On the Terrestrial Mollusca inhabiting Cook's Islands, Society Islands, and Samoan Group;' 'List of Land-Shell inhabiting Raraturu (one of the Austral Islands), with Remarks on their Synonymes and Geographical Range;' and several other papers."

— In seven months of the year which closed Dec. 31 the Metropolitan Asylums Board authorities of London had dealt with no fewer than 5,166 scarlet-fever patients; for 203 cases were admitted in June, 359 in July, 521 in August, 1,041 in September, 1,287 in October, 982 in November, and 773 in December. The board had at one time as many as 2,780 fever patients under treatment at one time, and, as a result of the general public utilizing to a greater extent than had ever been previously recorded the accommodation provided at the public expense, seven large hospitals had to be opened, and additional hut-accommodation provided. Fortunately the disease was not of a severe character, and the death-rate was not heavy. The admissions in September and October ranged as high as 50 and 60 per diem, but the disease has since sensibly declined. There were on the last day of 1887, 2,224 patients under treatment, suffering from fever of all kinds, but many of these patients are rapidly regaining health. One feature of the epidemic was the opening of the magnificent hospital for convalescing patients at Winchmore-hill, and another was the ready answer given to an appeal made by Miss Baker in the columns of *The London Times* for toys for the children. During 1887 London has, for the first time for many years, enjoyed an immunity from any serious amount of small-pox; for, although individual cases have occurred, very beneficial results have accrued from prompt removals and isolation of the disease.

— The *Publishers' Circular*, London, Eng., states that the total number of new books and new editions published in 1887 is not far from 500 in excess of the books of the previous year. Theology shows an increase of 60 or 70 on the last return. There are more than 100 educational works over the product of 1886, while in juvenile works the increase is less marked. Novels keep up their average of more than two per diem, Sundays included. Politico-economical books are less in number than usual, which is also the case in the department of arts and sciences, which includes illustrated

volumes. In voyages, exploration, and books descriptive of countries, we find about 50 new books recorded more than for 1886, while in history and biography there is a notable rise in the issue of new works, — over 100. Poetry and the drama are about equally represented with last year. In medicine and surgery, in belle-lettres and essays, as also in miscellaneous publications, a slight increase of production is shown.

— Mrs. Ayrton, the wife of the professor at the Technical School at Kensington, England, is going to give a course of experimental lectures on the practical uses of electricity to ladies. Mrs. Ayrton was educated at Girton College.

— The general meeting of the Association for the Improvement of Geometrical Teaching, London, was held Jan. 14. The following papers were read: 'The Recent Geometry of the Triangle,' by Mr. R. F. Davis; 'On the Multiplication and Division of Concrete Quantities,' by Prof. A. Lodge; and 'On some Principles of Arithmetic,' by Mr. W. G. Bell.

— A sufficient sum has been collected for the erection of a monument at Köping, in Sweden, in memory of the celebrated chemist and apothecary, Charles William Scheele, who was born, 1742, at Stralsund, and died, 1786, at the above-named town.

— The Argentine Information Office has just published an excellent map of the Argentine Republic, on the back of which is given a short description of the country and the latest information as to its political organization, agriculture, industries, commerce, revenue, and expenditure, railways, and various other subjects of interest.

— The Government of Batavia has given notice to the admiralty that the commander of His Netherlands Majesty's ship 'Samarang' reports the existence of a low, wooded island, hitherto uncharted, lying westward of Selaru, Timor Laut Islands. The island is reported to be about two miles long in a north-north-easterly and south-south-westerly direction, and about two-thirds of a mile broad; position as given, centre of island (approximate), latitude 8° 15' south, longitude 130° 39' east.

— A communication from the Government of Queensland to the admiralty states that the natives of Stephen Island, on the eastern side of Great North-East Channel, Torres Strait, who were formerly very ferocious and hostile, are now thoroughly quiet: they are supplied by the Government of Queensland with a boat, and are prepared to render assistance to any passing vessel requiring their services that will hoist a flag at the mast-head. Yams, sweet-potatoes, and cocoanuts can be obtained from these natives. There is good anchorage with south-easterly winds off the north-western end of the reef surrounding Stephen's Islands. At Murray Islands a mission station is established, where shipwrecked crews will be kindly treated, and taken to Thursday Island. At Darnley Island complete confidence can now be placed in the natives.

— In *Science* of Dec. 30, 1887, p. 323, second column, 23d line from bottom, the first 'south-west' should read 'south-east.'

LETTERS TO THE EDITOR.

. Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

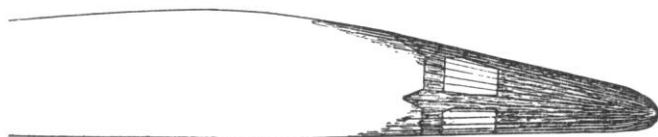
The Snow-Snake.

THE writer of an interesting article on Pocahontas, in a recent popular periodical, had evidently been reading up Morgan's works rather than early Virginia writers. The "hunting lodges, built up of mats, which they remove as they please," become "long, low houses of bark, . . . twenty families to a house." The "great fire made in a long house" becomes five, "each fire being shared by four families." The one seat at the end of Powhatan's house expands into stalls and bunks all around; and while it is said that "no one, in any household, was better off or of higher rank than his brothers or sisters," yet Powhatan is described as having "such an influence over his tribesmen that he was regarded as the head

man (president, we might say) of this forest republic, which comprised the thirty confederated tribes of Powhatan." These questions need not be discussed now, but such statements ought not to be made history.

My attention was directed to the article by a friend, who was surprised by a mention of the snow-snake among these primitive Virginians. The children indoors were playing at *gus-ha-eh* (or 'peach-pits'), it is said; but where the peaches came from at that early day is not explained. The "boys were tumbling about in the light snow, at their favorite game of *ga-wa-sa* (or the 'snow-snake')." The use of these Seneca words sufficiently shows the source of information, but it is not wise to place a Northern game so far South. Something more than a light snow is required for this sport; and boys do not tumble about in it, but stand up to their work. Neither would any one risk breaking the graceful shaft between the legs of one running at full speed.

I was recently surprised at not finding the snow-snake in the collection of Iroquois implements at the Museum of Natural History in New York, and still more to learn how few students of Indian life know any thing of it. A game something like it is found among some Western Indians, but the implement used is very different. Nor do I now recall any mention of it among early Indian games. That it would not be of general use is in the nature of things. Only in those colder regions where an icy crust often forms would it naturally occur. Even there it may be recent, as the head is always weighted with metal, melted into grooves, and nicely smoothed. Of course, this might have been different if its use was ancient. Morgan describes the Seneca snow-snake as being from five to seven feet long, and he gives a good figure and description. Those of the Onondagas are often longer. Mine is of their medium



size, and is upwards of seven feet long, while I have seen many not less than nine feet in length. They are very neatly made, for any irregularity would interfere with successful use. The smaller notched end of mine is but a trifle over half an inch wide by about a quarter deep. This increases to seven-eighths of an inch wide by one-half deep just back of the raised head at the other end. The head begins to rise about six inches from the extreme point with a gradual curve. Lead is inlaid in this, often in a pretty pattern; and I have thought it barely possible, granting its antiquity, that stone bird amulets may once have formed the heads. These seem to belong to woodland regions, where the winters are long, but such a use is hardly probable.

The game is simply one of dexterity and strength. The forefinger is placed in the basal notch, the thumb and remaining fingers reaching along the shaft, and the snow-snake is thrown forward on the ice or hard snow. It might go a little way through light snow, but this is not favorable to its use. An icy crust or the track of a sleigh, the travelled road, or even ice, are favorite resorts. A much worn road would injure the fine polish of the implement, and a level surface, with a good crust, is commonly chosen. On a fine winter's day men and boys are often seen in such places, pursuing this sport. They play quietly, for the Onondagas are a very quiet people, and one out of sight might know nothing of the most exciting game. When the slender shaft is thrown, it glides rapidly over the surface, with upraised head and a quivering motion, that gives it a strange resemblance to a living creature. The Christian Onondagas have abandoned its use, perhaps because betting is a feature of the game, or it may be they dislike its symbolism; but I think the former the true reason. The Senecas call it *ga-wa-sa*; the Onondagas, *ka-wher-tah*; neither of these words referring to its snaky appearance. I am unable to learn of any idea attached to the name, and this favors an early use. The game is to see which person or side can throw it farthest, and sometimes the distance of a quarter of a mile is reached under favorable circumstances, but I think this rare.

W. M. BEAUCHAMP.

Baldwinsville, N. Y., Dec. 30.

The Conspiracy of Silence.

THE Duke of Argyll's charge of a conspiracy of silence among scientific men, by means of which new truths are to be ignored, has been perhaps sufficiently answered. In fact, according to the duke's own statement, the theories of Messrs. Murray and Guppy are already printed, and are before the public for judgment. This discussion has been interesting, but, so far as I have seen, two points worthy of attention have not been brought out.

1. There is in all branches of learning a just and good conservatism. We cannot afford to give up scientific truths that have been acquired with much labor and difficulty. Hence, when theories are proposed that conflict with established principles, they are to be received with caution. No one can believe in perpetual motion until our theory of dynamics is overthrown. A mathematician who claims to solve the equation of the fifth degree will have a hard time in finding believers. If a writer on theoretical astronomy violates the rules of the calculus, he has no right to ask the respect of astronomers. He deserves to be ignored. Astronomers should not spend their time in demolishing absurd theories that may be proposed to them. The age of Don Quixote is past.

2. But in the discussion which has taken place the assumption seems to be made that scientific men are better, or ought to be better, than other people. Although this might be taken as a tacit compliment, I think it is a mistake. The truth is, that scientific men are very much like other people. They have the same desires, the same passions; and they will have the same greed for money and fame that other people have. If they place themselves on a footing devoid of morals, they will develop as mean men as the world has ever seen. But it is not simply from the character of the men who do scientific work that we are to look for good results. These come rather from the scientific method, which, in its final judgment, pays no regard to the condition of the worker. The question is only if his result is right. The dissipated young Frenchman, Galois, was killed in a duel at the age of twenty-one, but his genius was so powerful that he left an indelible mark on the old science of mathematics. His work remains, and in using it we do not consider Galois and his extreme republican principles. ASAPH HALL.

Washington, D. C., Jan. 10.

One of the Causes of the Inefficiency of the Reis Telephone.

SOME who have experimented with the Reis telephone declare that they have never been able to hear a transmitted word. Others have heard some words and sentences; but these have always been weak and irregular, so as generally to discourage one in a short time, especially now, when through the improvements in telephones it is possible to reproduce words both loudly and regularly. Experimenters therefore have been impatient with Reis's apparatus, and seldom have done any thing with it, except make some hasty tests for some phase of the great telephone controversy.

The inefficiency of the Reis telephone has, by a kind of common consent, been admitted to be altogether due to the imperfect mechanical operation of the transmitter, by which the making and breaking of the current when it is in operation is such as not to properly follow the actual vibratory movements of the diaphragm when the latter is moved by speech-vibrations; that at best it can deliver to the line only the fundamental rate of the vibration, leaving out the characteristic over-tones which are supposed to be necessary to the successful transmission of speech. This judgment as to the mode of operation of the transmitter has been derived wholly from what has been heard by one listening at the receiver; for there is to-day no known method by which it may be determined whether or not a transmitter has the proper motions, except by listening at the receiver. That is the test. Hence it has been concluded, that, if speech was not properly delivered in a receiver, the trouble must be with the lack of proper movements of the transmitter. Yet it is mechanically possible for the transmitter to move properly, and the receiver to be so much overloaded, so to speak, that the latter fails to be heard on account of the extra disturbance.

The Page effect — the magnetic click — may be so strong in a Reis receiver, with a proper current, as to be heard a good many feet distant from it. When the receiver is held against the ear, the sound may be very loud; so much so as to quite drown weaker

sounds, if they happen to be present. Especially when these loud sounds occur fifty or one hundred or more times per second, the effect is that of a continuous sound; and as the persistence of hearing is something like the tenth of a second, it follows, *a priori*, that such rates of vibration as from two hundred to a thousand per second might be present, yet too weak to be heard in the presence of such overpowering sounds that have an appreciable persistent effect. These loud magnetic clicks are heard only when there is a sudden break in the current in the receiver. If, then, some way can be devised for preventing these extraneous sounds in the receiver without interfering at all with the transmitter or its 'mode of operation,' one may experimentally determine whether the Reis transmitter does or does not act mechanically so as to vary the current in correspondence with speech or other sound-vibrations. I therefore conceived, that, if there was a short-shunt circuit between the terminals of the transmitter, some of the current would traverse the coil of the receiver the whole time, no matter whether the circuit through the transmitter was open or closed. The loud clicks would be suppressed without interfering in any way with the 'mode of operation' of the transmitter; and, if the latter really did follow the motions of the diaphragm, the variations in the current strength would correspond, and the speech would be heard. This I found to be truly the case: for with a transmitter thus provided with a shunt circuit of about two ohms, which could be switched in or out with a key, it was at once possible to hear a large part of what was spoken when the shunt was in; when it was out of circuit, the sounds were generally inarticulate.

This experiment is an *experimentum crucis*, and proves that the inefficiency of the Reis telephone is much more due to the extraneous sounds in the receiver than to the lack of appropriate motions of the platinum terminals of the transmitter. It proves that the transmitter does and must always have worked in the proper mechanical way, and that the current theory of its mode of operation is not correct. It proves, too, that when carbon is substituted for the platinum terminals, there is an improvement in efficiency, but not in its mode of operation.

A. E. DOLBEAR.

College Hill, Mass., Jan. 14.

Queries.

23. DROPS OF WATER.—Will some reader of *Science* explain the floating of drops of water upon the general surface? It is a very common phenomenon, not to be confused with the formation of bubbles, though often produced by the same sort of agitation; for example, the breaking of a wave. In still water they may be produced by an oblique blow with an oar or with the hand, but will disappear as soon as their original momentum has been lost. Recently on Lake Pontchartrain, with a brisk wind which kept them in motion, I observed some which exceeded an eighth of an inch in diameter, and lasted more than two minutes. The depression, like that of a floating needle, which surrounded each one, was also plainly visible. Their behavior was in striking contrast with that of the bubbles with which they were mingled, the drops moving much more rapidly with the wind, and also rolling under the influence of gravity towards the trough of each successive wave.

E. J. POND.

New Orleans, Jan. 9.

Answers.

21. GLOBULAR LIGHTNING.—The note on globular lightning in the issue of Dec. 30 recalls to mind a phenomenon of the kind I witnessed some years ago. While walking upon the Worcester and Norwich Railroad track about a mile south of Worcester Junction, I suddenly saw a ball of fire, or what looked like it, about the size of a large marble, running along on top of one of the rails just ahead of me. It was going at so slow a rate that I could have overtaken it in a few seconds, and my first impulse was to do so; but the sober second-thought warned me against making the attempt. I, however, watched it move until it came to the end of a rail separated from the adjacent one by something like half an inch, when it stopped, and in a second or two vanished, when there was a clap of thunder in a cloud overhead which I had not before noticed as being a thunder-cloud. The brightness of this small

ball was not excessive, nothing to be compared with an electric arc. It was more like that of a red-hot bullet. It did not scintillate or make any noise, that I noticed. Now, while this was an accompaniment of a thunder-cloud, as are such manifestations generally, I think there is some reason for not calling the phenomenon itself an electrical one in the same sense as lightning is electrical. If electricity can gather itself up into a spherical form as if it was subject to some sort of cohesion, and if it can roll along on top of a good conductor instead of traversing the body of the conductor subject to Ohm's law, then there are some exceptions to this latter law. Other observers have seen still larger balls roll slowly upon the ground, or move with great deliberation in the air, apparently without exhibiting the property of attraction or repulsion. Some years ago an acquaintance in southern New Hampshire told me that such a fire-ball came down to the ground near his house, and rolled slowly about near where a hog was. The hog walked up to it as if to root it along, and touched it with its snout, when it exploded with a great noise, killing the hog instantly, blowing it to pieces. In this case, and in other similar ones, it appears that the luminosity is not caused by high temperature. Babinet reports a case that he investigated, where a globe of fire came into the room of a tailor who was eating his dinner. It was about the size of a child's head, and moved about upon the floor, approaching his legs as a kitten might have done; but he prudently drew his feet away, and watched it. It appeared bright, but the tailor said he felt no sensation of warmth. After remaining several seconds upon the floor, it rose vertically five or six feet in the air, and then moved towards a pipe-hole in the chimney, which was covered with paper, which it tore off, and went up the chimney. Near the top it exploded, and did considerable damage to the chimney and the roof of the house. Such a performance is entirely unlike electrical phenomena. It exhibits none of the characteristics of electricity, either in form, in motion, in heat, in attraction, and why should it be called an electrical phenomenon? It is true, in most of the cases reported the disruption of the globe resulted in electrical phenomena, sudden and destructive; but so would a charged secondary cell, that might have relatively a very large amount of potential electricity in it: that is, the stored chemism may be transformed into electricity at a very rapid rate, but we do not now consider that electricity is stored in the cell, because we can get a large amount of electrical energy out of it. The charged secondary cell is the result of electrical work; but, so long as the energy is stored in such a way as to manifest none of the properties of electricity, it is improper to speak of it as other than chemism. In like manner, if energy be stored in such a globular form as is called 'globular lightning,' which does not exhibit any of the properties of electrical energy, it seems to me that we are not justified in calling it an electrical phenomenon. We have in physics already too many *ex post facto* terms, such as 'heat' rays, 'light' rays, and 'actinic' rays; and it is a pity to call this 'globular lightning' if the only appropriate part of the name is 'globular.' If we don't know what specific form the energy exists in, we know that it is globular energy; and 'globular vim' would be better than 'globular lightning.'

A. E. DOLBEAR.

College Hill, Mass., Jan. 12.

22. WASP-STINGS.—In answer to Mr. Ames's query in *Science* for Jan. 13, I will say that I have picked up hundreds of lively wasps, holding my breath at the moment when the wasp was grasped, and have never been stung under such circumstances. I have frequently been stung by wasps when I have disturbed them unawares, which shows that there is nothing in my make-up which would prevent wasps from stinging me if they had the power and were so disposed. I have captured a dozen wasps, one after the other, until I had a handful, which I have held as long as I chose, without receiving a single sting. I cannot say that I would have been stung had I not held my breath at the moment of contact with the wasps, but can only testify that I was not stung in a single instance when I did hold my breath. As to the explanation of the phenomenon, I have none to give. I have tried the experiment on hornets, honey-bees, and bumblebees, and a single trial with each was sufficient to prove that the plan did not work with either of these species.

FAYETTE SAFFORD.

Willimantic, Conn., Jan. 16.